

What is claimed is:

1. An image forming apparatus comprising:

an image forming unit for forming a correcting image  
for correcting gradations of an output image, on a bearing  
5 body;

a sensor for measuring reflected light quantity of the  
correcting image formed on the bearing body;

a gradation correcting unit for correcting the  
gradations of the output image, based on a measurement result  
10 of the measured reflected light quantity of the correcting  
image; and

a timing correcting unit for detecting a shift of  
measurement timing, based on the measurement result by the  
sensor, and for correcting the detected shift of the  
15 measurement timing.

2. The image forming apparatus of claim 1,

wherein the correcting image comprises a gradation  
pattern comprising a plurality of gradations;

20 the sensor measures the reflected light quantities of  
the correcting image at fixed interval timing; and

the timing correcting unit detects a shift between  
specified timing prescribed in advance as timing at which a  
measurement of a head part of the gradation pattern is  
25 started, and timing at which a measured value having a largest  
change of the measured light quantity value in a vicinity of

the specified timing is measured, as the shift of the measurement timing, based on the measured values measured at the fixed interval timing.

5           3.       The image forming apparatus of claim 1,  
              wherein the correcting image comprises a gradation  
              pattern comprising a plurality of gradations;  
              the sensor measures the reflected light quantities of  
              the correcting image at fixed interval timing; and  
10           the timing correcting unit detects the shift between  
              specified timing prescribed in advance as timing at which a  
              measurement of a head part of the gradation pattern is  
              started, and timing at which a measured value near to an  
              intermediate light quantity value of the measured values in  
15           a vicinity of the specified timing is measured, as the shift  
              of the measurement timing, based on the measured values  
              measured at the fixed interval timing.

              4.       The image forming apparatus of claim 1, wherein  
20           the timing correcting unit corrects the measurement timing  
              of the sensor by the shift quantity of the detected  
              measurement timing.

              5.       The image forming apparatus of claim 1,  
25           wherein the timing correcting unit corrects the shift  
              of the measurement timing by selecting the measured value to

be applied as an output density value of each gradation in the gradation pattern among the respective measured values measured by the sensor according to the detected shift quantity of the measurement timing; and

5           the gradation correcting unit performs the gradation correction based on the measured value selected as the output density value of each gradation.

6.       The image forming apparatus of claim 1,  
10       wherein the correcting image comprises a gradation pattern comprising a plurality of gradations; and  
          the timing correcting unit detects the respective shift of the measurement timing from the plurality of gradation patterns, and performs the correction of the  
15       measurement timing by applying the shift quantities of the measurement timing, which are detected in the respective gradation patterns, to each of the gradation patterns.

7.       The image forming apparatus of claim 1,  
20       wherein the correcting image comprises a gradation pattern comprising a plurality of gradations; and  
          the timing correcting unit detects the respective shift of the measurement timing from the plurality of gradation patterns, and corrects the shift of the measurement  
25       timing by applying an average value of the shift quantities, which are detected in the respective gradation patterns, to

all of the gradation patterns, as a common shift quantity.

8. The image forming apparatus of claim 6, wherein the plurality of gradation patterns are all same gradation patterns.

9. The image forming apparatus of claim 6, wherein the plurality of gradation patterns are different from one another.

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10. The image forming apparatus of claim 2, wherein each gradation of the gradation pattern is formed in order that the measurement by the sensor is performed in an order from a high density gradation to a low density gradation.

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11. The image forming apparatus of claim 1, wherein the correcting image comprises a plurality of colors;

the gradation correcting unit performs the gradation correction of each color based on the measured value of the reflected light quantity of the correcting image comprising the plurality of colors; and

the timing correcting unit corrects the shift of the measurement timing every measurement of the reflected light quantity of the correcting image of each color.

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12. The image forming apparatus of claim 1,  
wherein the bearing body is a transfer member; and  
the sensor measures the reflected light quantity of  
the correcting image formed on the transfer member.

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13. An image forming apparatus comprising:  
an image forming unit for forming a correcting image,  
which is an image for correcting gradations of an output image  
and comprises a gradation pattern comprising a plurality of  
10 gradations, on a bearing body;

a sensor for measuring reflected light quantities of  
the correcting image formed on the bearing body at fixed  
interval timing;

a gradation correcting unit for correcting the  
15 gradations of the output image, based on measurement results  
of the measured reflected light quantities of the correcting  
image; and

a timing correcting unit for detecting a shift between  
specified timing prescribed in advance as timing at which a  
20 measurement of a head part of the gradation pattern is  
started, and timing at which a measured value having a largest  
change of the measured light quantity value in a vicinity of  
the specified timing is measured, as the shift of the  
measurement timing, based on the measured values measured at  
25 the fixed interval timing, and for correcting the detected  
shift of the measurement timing.

14. An image forming apparatus comprising:

an image forming unit for forming a correcting image,  
which is an image for correcting gradations of an output image  
5 and comprises a gradation pattern comprising a plurality of  
gradations, on a bearing body;

a sensor for measuring reflected light quantities of  
the correcting image formed on the bearing body at fixed  
interval timing;

10 a gradation correcting unit for correcting the  
gradations of the output image, based on measurement results  
of the measured reflected light quantities of the correcting  
image; and

a timing correcting unit for detecting a shift between  
15 specified timing prescribed in advance as timing at which a  
measurement of a head part of the gradation pattern is  
started, and timing at which a measured value near to an  
intermediate light quantity value of the measured values in  
a vicinity of the specified timing is measured, as the shift  
20 of the measurement timing, based on the measured values  
measured at the fixed interval timing, and for correcting the  
detected shift of the measurement timing.

15. An image forming apparatus comprising:

25 a bearing body on which an image to be detected is  
formed;

a sensor for performing a plurality of measurements at a prescribed interval, to a surface of the bearing body moving relatively; and

a judging unit for judging which measurement result  
5 is a detection result of the image to be detected, which is formed on the surface of the bearing body, among the plurality of measurement results.

16. The image forming apparatus of claim 15,  
10 wherein the sensor is controlled to perform a plurality of times of the measurements at fixed time interval.

17. The image forming apparatus of claim 16,  
wherein the judging unit corrects measurement timing of the  
15 sensor based on a judgment result by the judging unit.

18. The image forming apparatus of claim 15,  
wherein the image to be detected is a gradation pattern comprising a plurality of gradation images different from one  
20 another.

19. The image forming apparatus of claim 18,  
wherein the sensor performs a plurality of times of the measurements of reflected light quantities at the  
25 prescribed interval; and

the judging unit detects a shift between specified

timing prescribed in advance as timing at which a measurement of a head part of the gradation pattern is started, and timing at which a measured value having a largest change of measured light quantity value in a vicinity of the specified timing is measured, as the shift of the measurement timing, based on the plurality of measurement results by the sensor, and corrects the specified timing so as to remove the shift.

20. The image forming apparatus of claim 15,  
wherein the bearing body is any one of a photosensitive body, a transfer member onto which a toner image on the photosensitive body is transferred, and a recording material on which an image is recorded.

21. The image forming apparatus of claim 15,  
further comprising:  
a storage unit for storing the image to be detected;  
an image forming main body unit for forming the image to be detected, which is stored in the storage unit, on the bearing body; and  
a gradation correcting unit for correcting gradations of an output image output from the image forming main body unit, based on a result of the measurement of the image to be detected by the sensor.

22. A gradation correction method comprising:



forming a correcting image for correcting gradations of an output image, on a bearing body;

measuring reflected light quantity of the correcting image formed on the bearing body by the sensor;

5 detecting a shift of measurement timing based on a measurement result by the sensor, and correcting the detected shift of the measurement timing; and

correcting the gradations of the output image, based on a measured value of the reflected light quantity of the  
10 correcting image after the correcting of the measurement timing.

23. The gradation correction method of claim 22,  
wherein the correcting image comprises a gradation  
15 pattern comprising a plurality of gradations;

the measuring is performed by measuring the reflected light quantities of the correcting image at fixed interval timing; and

the detecting and the correcting of the shift is  
20 performed by detecting the shift between specified timing prescribed in advance as timing at which a measurement of a head part of the gradation pattern is started, and timing at which the measured value having a largest change of the measured light quantity value in a vicinity of the specified  
25 timing is measured, as the shift of the measurement timing, based on the measured values measured at the fixed interval

timing.

24. The gradation correction method of claim 22,  
wherein the correcting image comprises a gradation  
5 pattern comprising a plurality of gradations;

the measuring is performed by measuring the reflected  
light quantities of the correcting image at fixed interval  
timing; and

the detecting and the correcting of the shift is  
10 performed by detecting the shift between specified timing  
prescribed in advance as timing at which a measurement of a  
head part of the gradation pattern is started, and timing at  
which the measured value near to an intermediate light  
quantity value of the measured values in a vicinity of the  
15 specified timing is measured, as the shift of the measurement  
timing, based on the measured values measured at the fixed  
interval timing.

25. The gradation correction method of claim 22,  
20 wherein the detecting and the correcting of the shift is  
performed by correcting the measurement timing of the sensor  
by the shift quantity of the detected measurement timing.

26. The gradation correction method of claim 22,  
25 wherein the detecting and the correcting of the shift  
is performed by correcting the shift of the measurement timing

by selecting the measured value to be applied as an output density value of each gradation in the gradation pattern among the respective measured values measured by the sensor according to the detected shift quantity of the measurement timing; and

the correcting of the gradations is performed by performing the gradation correction based on the measured value selected as the output density value of each gradation.

27. The gradation correction method of claim 22, wherein the correcting image comprises a gradation pattern comprising a plurality of gradations; and

the detecting and the correcting of the shift is performed by detecting the respective shift of the measurement timing from the plurality of gradation patterns, and by performing the correction of the measurement timing by applying the shift quantities of the measurement timing, which are detected in the respective gradation patterns, to each of the gradation patterns.

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28. The gradation correction method of claim 22, wherein the correcting image comprises a gradation pattern comprising a plurality of gradations; and

the detecting and the correcting of the shift is performed by detecting the respective shift of the measurement timing from the plurality of gradation patterns,

and by correcting the shift of the measurement timing by ,  
applying an average value of the shift quantities, which are  
detected in the respective gradation patterns, to all of the  
gradation patterns, as a common shift quantity.

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29. The gradation correction method of claim 27,  
wherein the plurality of gradation patterns are all same  
gradation patterns.

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30. The gradation correction method of claim 27,  
wherein the plurality of gradation patterns are different  
from one another.

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31. The gradation correction method of claim 23,  
wherein each gradation of the gradation pattern is formed in  
order that the measurement by the sensor is performed in an  
order from a high density gradation to a low density  
gradation.

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32. The gradation correction method of claim 22,  
wherein the correcting image comprises a plurality of  
colors;

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the detecting and the correcting of the shift is  
performed by correcting the shift of the measurement timing  
every measurement of the reflected light quantity of the  
correcting image of each color; and

the correcting of the gradations is performed by performing the gradation correction of each color based on the measured value of the reflected light quantity of the correcting image comprising the plurality of colors.

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33. The gradation correction method of claim 22, wherein the bearing body is a transfer member; and the measuring is performed by measuring the reflected light quantity of the correcting image formed on the transfer member.

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34. A gradation correction method comprising: forming a correcting image, which is an image for correcting gradations of an output image and comprises a gradation pattern comprising a plurality of gradations, on a bearing body;

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measuring reflected light quantities of the correcting image formed on the bearing body, by a sensor at fixed interval timing;

20

detecting a shift between specified timing prescribed in advance as timing at which a measurement of a head part of the gradation pattern is started, and timing at which a measured value having a largest change of the measured light quantity value in a vicinity of the specified timing is measured, as the shift of the measurement timing, based on the measured values of the reflected light quantity measured

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at the fixed interval timing, and correcting the detected shift of the measurement timing; and

correcting the gradations of the output image, based on the measured value of the reflected light quantity of the  
5 correcting image after the correcting of the measurement timing.

35. A gradation correction method comprising:

forming a correcting image, which is an image for  
10 correcting gradations of an output image, and comprises a gradation pattern comprising a plurality of gradations, on a bearing body;

measuring reflected light quantities of the correcting image formed on the bearing body by a sensor at  
15 fixed interval timing;

detecting a shift between specified timing prescribed in advance as timing at which a measurement of a head part of the gradation pattern is started, and timing at which a measured value near to an intermediate light quantity value  
20 of the measured values in a vicinity of the specified timing is measured, as the shift of the measurement timing, based on the measured values of the reflected light quantity measured at the fixed interval timing, and correcting the detected shift of the measurement timing; and

25 correcting the gradations of the output image, based on the measured value of the reflected light quantity of the

correcting image after the correcting of the measurement timing.

36. A control method of an image forming apparatus  
5 comprising:

forming an image to be detected, on a surface of a bearing body;

performing a plurality of measurements to the surface of the bearing body moving relatively, by a sensor at a  
10 predetermined interval; and

judging which measurement result is a detection result of an image to be detected, which is formed on the surface of the bearing body, among the plurality of measurement results.

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37. The control method of claim 36, further comprising correcting measurement timing by the sensor, based on a judgment result in the judging.

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38. The control method of claim 36,

wherein the image to be detected is a gradation pattern comprising a plurality of gradation images different from one another; and

the performing of the plurality of measurements are  
25 performed by measuring reflected light quantities a plurality of times;

the control method further comprising,

detecting a shift between specified timing prescribed  
in advance as timing at which a measurement of a head part  
of the gradation pattern is started, and timing at which a  
5 measured value having a largest change of a measured light  
quantity value in a vicinity of the specified timing is  
measured, as the shift of the measurement timing, based on  
the plurality of measurement results; and

correcting the specified timing so as to remove the  
10 detected shift.

39. The control method of claim 36, further  
comprising correcting gradations of an output image based on  
the measurement result of the image to be detected in the  
15 performing of the plurality of measurements.